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4. World Maps of GMOs and Organic Agriculture

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New world maps of two competing agricultures reveal striking differences in the uptake and the global distribution of certified organic agriculture and GMO (genetically modified organism) agriculture (Fig.1 & Fig.2). Organic agriculture is reported from 181 countries (69.8 million hectares). This compares GMO agriculture which is reported from 24 countries (189.8 million hectares).

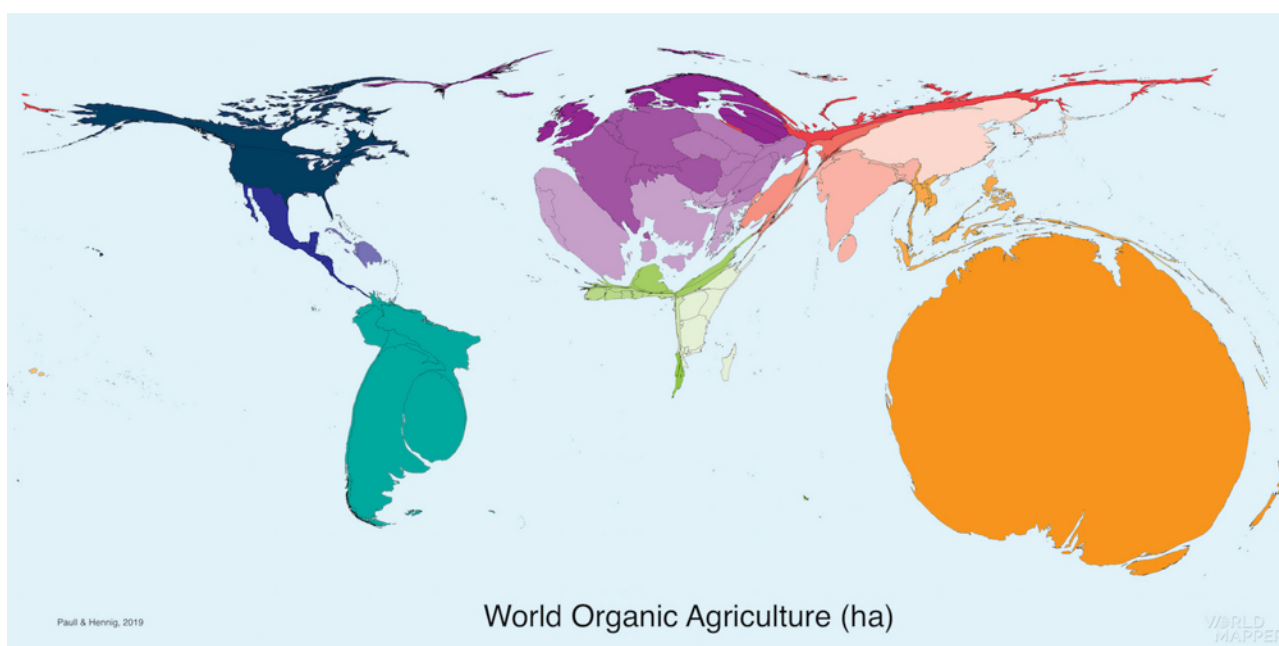


Figure 1. World map of certified organic agriculture hectares (density equalising cartogram).



Figure 2. World map of GMO agriculture hectares (density equalising cartogram).

Certified organic agriculture has grown at 13.2% per annum for the past five years and organic produce attracts a price premium. This compares to GMO agriculture which has grown at 2.2% per annum for the past five years and GMO produce attracts a price penalty.

The world organics map reveals the achievement of Australia (with 35.6m ha) which, after decades of being the global organics leader, now accounts for the majority (51%) of the total global organics hectares. Argentina is in second place, with 3.4 million certified organic hectares, followed by China (3.0m ha), Spain (2.1 m ha), and USA (2.0m ha). These are followed by Italy (1.9m ha), Uruguay (1.9m ha), India (1.8m ha), France (1.7m ha), Germany (1.4m ha), Canada (1.2m ha), and Brazil (1.1m ha). Other countries each report less than a million hectares of certified organic agriculture hectares. The organics map reveals the great opportunities for the uptake of organics in Africa which is just a vestigial presence on the world organics map.

The world GMO map reveals the dominance of the GM4 countries of North and South America: USA, Canada, Brazil and Argentina. Taken together, the GM4 account for 85% of the world's GMO agriculture hectares. USA (79.0m ha) accounts for 40% of global GMO hectares, followed by Brazil (50.2 m ha; 26%), Argentina (23.6m ha; 12%) and Canada (13.1m ha; 7%). India (GM cotton) and Pakistan (GM cotton) give Asia a presence on the GMO world map. South Africa (GM corn, soy, cotton) gives Africa a presence. Australia is just a skeletal presence on the GMO world map.

Just four GMO crops account for more than 99% of the global GMO hectares: GM soy (50%), GM corn (31%), GM cotton (13%) and GM canola (5%). USA leads the uptake of GMOs, growing not only the 'big four' GM crops (soy, corn, cotton & canola) but also reports modest plantings of GM sugar beet, alfalfa, papaya, squash, potato, and apples.

In contrast to the very narrow range of organisms in GMO agriculture, organic agriculture embraces the full spectrum of food crops including fruits, vegetables, fungi, beverages, spreads, and animal products.

Globally, consumers remain skeptical of the merits and safety of GMO foods. Only 10% of Australian consumers agree with the proposition that GMO agriculture is safe. Resistance to GMO foods is widespread globally. In China 60% of consumers avoid GMO foods. These sentiments along with the reliance on herbicides, particularly, glyphosate, are a brake on the further uptake and diversification of GMO agriculture. In contrast, as consumers seek out organic products, the diversification of organic choices expands in the marketplace, and global demand for organic produce continues to grow.

Technical note:

These maps are density equalising cartograms. For such maps, equal areas of a cartogram account for equal measures of the parameter being mapped. These maps use an algorithm of the Worldmapper project <worldmapper.org>.

Further reading:

Paull, J., & Hennig, B. (2016). Atlas of Organics: Four maps of the world of organic agriculture. *Journal of Organics*, 3(1), 25-32. <http://www.academia.edu/25648267/Atlas_of_Organics_Four_maps_of_the_world_of_organic_agriculture>

Paull, J., & Hennig, B. (2018). Maps of Organic Agriculture in Australia. *Journal of Organics*, 5(1), 29-39. <http://www.academia.edu/37851248/Maps_of_Organic_Agriculture_in_Australia>

Paull, J., & Hennig, B. (2019). New world map of genetically modified organism (GMO) agriculture: North and South America = 85%. *Acres Australia*, 101, 59-60.

Paull, J., & Hennig, B. (2019). New world map of organic agriculture: Australia is 51%. *Acres Australia*, 101, 35-36.
